Chemical Conservation & Research Laboratory of the Government Museum Madras

GOLDEN JUBILEE 1930–1982

Chemical Conservation Laboratory

1930–1982

The Chemical Laboratory in the Madras Government Museum*

By Dr. S. PARAMASIVAN°, M. A., D. Sc.

Dr. F. H. GRAVELY, who was Superintendent of the Madras Government Museum from 1920 to 1940, was responsible to a great extent for building up the research activities of the great institution, and giving it a place among the great Museums of the world. The Chemical Laboratory in the Museum owes its inception to his scientific vision and forethought.

It is well within the knowledge of scholars that the Madras Government Museum has the richest collection of world famous South Indian bronzes of great value. These bronze collections have already impressed distinguished scholars from all parts of the world.

Bronzes are always subject to a process of corrosion. The process is intensified by the saline atmosphere caused by the nearness of the sea, as at Madras. Most of the bronzes in the Madras Museum are treasure-trove finds. They had been lying buried under the earth for centuries. Through contamination with soil and mineralized waters, they became seriously corroded. A thick crust of basic carbonate and basic chloride was formed on the surface hiding all the decorative details and inscriptions. At times, there were also bluish green specks, which attacked the bronze and enlarged and caused corrosion in an epidemic form. These processes have been going on continuously for years. The bronzes have been removed in this condition to the Museum. It is, therefore, necessary to eliminate the corrosive

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* Reproduced from the Centenary Souvenir, 1951, Govt. Museum, Madras.

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crusts, so as to expose the details underneath. Occasionally, however, one comes across a crust, which is uniform in character, and of pleasing enamel-like appearance. This crust, which is called, "patina" is quite compact and protects the bronze from further disintegration and the details are still visible through it.

With the valuable collection, as at the Madras Government Museum, it was felt necessary to treat the bronzes disfigured by corrosive crusts in order to expose the decorative details and to eliminate the bronze disease, which brings in added deterioration. As early as 1923, these facts were realized by the then Superintentent of the Museum, Dr. F. H. Gravely, who for the first time, moved the Madras Government for the appointment of an Archaeological Chemist to undertake this task. As an experimental measure, Mr. Ram Singh Ahuja, who had been a Government of India scholar working under the Archaeological Chemist in India, Dehra Dun, was appointed to the post, fox six months. At the end of this period, the results of his experiments were communicated to the Government of Madras who referred them to Prof. Erlam Smith, then Professor of Chemistry in the Presidency College, Madras.

It is well known that corrosion is an electro-chemical process, and a reversal of this process will restore the corroded object back to its original state. This principle had been suggested by Prof. Colin G. Fink, an eminent electrochemist, for the restoration of bronzes in the Metropolitan Museum of Art New York. The method has been applied with considerable success in important American Museums such as the Metropolitan Museum, Field Museum of Natural History, Chicago, and by some of the American Excavation units working in Greece. Prof. Smith felt that the same method must be employed with modification for the restoration of bronzes in the Madras Government Museum.

The suggestion was accepted by the Madras Government and an Archaeological Chemist was specially appointed and exclusively set on this task, under the guidance of Prof. Smith. The present writer was appointed to the post in 1930. The work of electrolytic restoration has been going on since then.

With regard to the electrolytic treatment, the American Museum had to deal with bronzes of about 12 to 18 inches, while the bronzes in the Madras Government Museum are about $4\frac{1}{2}$ feet in height. The former is analogous to a laboratory scale of work and the latter to the industrial scale, which demands a technique of its own. The difference may be realized better from the fact that the maximum power output in American Museums is about 100 watts, while in Madras it is about 7,000 watts.

The machinery for the electrolytic reduction was specially designed by the Metropolitan Vickers and consisted of a 12 h.p. motor generator set capable of giving an output 7 K.W. There are three parallel circuits, with ranges 0-60, 0-20 and 0-5 amps. so that three lots of bronzes can be treated simultaneously. The output can be adjusted to get any desired voltage. In this process, a cast iron vat, insulated from the ground, acts as the electrolytic cell as well as the anode and the bronze insulated from the cell, acts as the cathode. A two per cent aqueous solution of caustic soda serves as electrolyte.

The excellence of the method can be gauged from the following facts. Bronzes which had been covered over with such a heavy crust that they appeared shapeless and unrecognizable, were restored to their original form, and many interesting details have been laid bare after removal of the crust. This also ensures the long life of the bronze. These facts

will become clear from the Museum albums of photographs of bronzes before and after cleaning. In 1932, Sir Richard Gregory, F.R.S., Editor of *Nature* visited the laboratory and was greatly impressed with the work. In a press interview which he gave on 'Scientific work in India,' he made a special mention of the electrolytic process employed in the Madras Museum.

The electrolytic process has been extended to coins and iron antiquities.

In 1935, the Museum Commission headed by Mr. S. F. Markham and Mr. H. Hargreaves, visited the Madras Government Museum. They were greatly interested in the work done in the chemical laboratory and suggested that all the exhibits in the Museum and not merely the bronzes, must be included within the chemist's purview. Thus the activities of the archaeological chemist were widened. The laboratory was at first located in a temporary three-roomed structure, which had been intended for a restaurant. With increased activity, additional laboratory accommodation was found necessary. In 1937, a separate laboratory was built, being the only one of its kind in India. Simultaneously, all the exhibits in the Museum in the archaeological, anthropological, and pre-historic sections came up for treatment. Such widely differing materials as gold, silver, bronze, lead, iron, stone, including limestone and marble, textiles, leather and the like came up to the chemical laboratory for chemical treatment and preservation.

The Madras Museum is one of the few institutions in India where the quarterly examination of the exhibits is being conducted by the chemist and the curators of the sections concerned. This acts as a check on the deterioration of the exhibits.

The Madras Museum was also of help to the Archaeological Survey of India. In 1935, Mr. J. F. Blakiston who was then Director-General of Archaeology in India, requested Dr. Graveiy to spare the services of the Museum Chemist to examine and report on the condition of the Ajanta-like paintings in the Brihadisvara temple at Tanjore, and to preserve the paintings at Sittannavasal in the Pudukkottai State. Dr. Gravely was quick to realize the paucity of experts in this country to deal with problems of preservation of our rich cultural heritages in the form of ancient paintings. He was also impressed with the urgency in matter of treatment of paintings. Though the subject did not come within the purview of the Museum, he realized the peculiar circumstances and co-operated fully with the efforts of Mr. J. F. Blakiston.

This was the starting point for a general scientific survey of wall paintings, which were disintegrating in many parts of India. This laboratory was the first to conduct a scientific survey and publish the results in leading scientific journals such as *Nature*, *Technical Studies*, *Proceedings, of the Indian Academy of Sciences*, *Journal of the University of Madras*, *Current Science*, *Journal of the Indian Society of Oriental Art*, etc. In 1943, and at the request of the Archaeological Survey of India, another fresh survey of the condition of some of the important wall paintings was made by the Museum Chemist under orders of the Government of Madras.

It may be of interest to know that the preliminary work done in the Madras Museum as early as 1935, was the basis for the systematic treatment of Tanjore paintings, which was undertaken by the Department of Archaeology in 1946.

Paintings were not the only subjects which were tackled here. There are many metallic antiquities, whose exact methods of fabrication have to be worked out experimentally to reconstruct the technical skill and technical achievements of the ancients in the field of metallurgy. A beginning was made in this direction in the Madras Government Museum, supplemented by the facilities available at the Chemical and Metallurgical Laboratories of the M. & S. M. Railway, Madras.

The Laboratory has given training in methods of preservation to Museum workers from Pudukkottai, Hyderabad, Nagpur, Baroda, etc.

THE LABORATORY SINCE THE MUSEUM CENTENARY

In the preceding article published in this brochure, Dr. Paramasivan, who was responsible for setting up this laboratory, has recounted the story of its beginnings and its work upto the time of the Centenary of the Museum in 1951. He left it in 1946 to join the Archaeological Survey of India. He was succeeded by Mr. Nageswara Sastri and then Mr. B. Narayana Shenoy who were here only for short periods of time. The next Curator of the Chem. Cons. Section, who left his mark on the Lab. was Mr. R. Subramanian who joined it in 1949. His was a time of further consolidation of the Lab. as a centre of conservation activity. During his tenure as Curator, he went in 1954-55 to the U. S. for training in methods of chemical conservation, especially electrolytic treatment of bronzes. Mr. Subramanian carried out research in the composition of glass beads from Arikamedu and pulished the results in "Current Science". Mr. Subramanian was away from the Laboratory for short spells of time on three occasions during which Mr. K. Subramanian, Dr. T V. Satyamurti and Mr. Harinarayana acted in his place. Mr. Subramanian also realized the need for expanding the Laboratory's facilities and prepared plans for a new two-storeyed building for including further sections on analytical chemistry and physical exminations of objects.

When Mr. Subramanian left in 1956 for setting up a Science Museum in the the National Physical Lab., Thiru B. Ramachandran, a chemical engineer, took over charge of the Laboratory. It was the first time that a chemical engineer was appointed as Curator of this Section. Thiru Ramachandran interested himself in the weights of coins as an index to their circulation as well as periods of their currency, and published a paper on his findings.

In May 1957, Mr. N. Harinarayana became the Curator for Chemical Conservation and in the same year, the plans for expansion of the Laboratory sent earlier in Mr. R. Subramanian's time were sanctioned, and the construction work on the new building was commenced. At the same time, requirements of furniture and equipment for the new block were also prepared and got sanctioned. The work of setting up of the Lab was going on apace when Mr. Harinarayana went to France on a French Govt. Fellowship for training in restoration of paintings at the Laboratory of the Lourve Museum and also to London for training in tha Lab. of the Institute of Archaoeology. During his absence abroad, Mr. Gopalakrishnan, another chemical engineer, was incharge of the Laboratory.

The new building of the Lab. was made ready in all respects and opened formally in September 1963 by His Excellency Shri Bishnuram Medhi, who was the Governor of Madras. A number of new equipment had been purchased meanwhile and set up, such as a Carl Zeiss spectro photometre, a Phillips X-ray unit, a vacuum fumigation chamber, a Selenium Rectifier for the electrolytic equipment, a fumigation chamber for archival materials. The selenium rectifier was specially designed for taking over supply of a steady direct current to the electrolytic cells. This expansion of the Laboratory was an important event since such a well-equipped lab. for censervation work in a museum was unique at that time in our country. With the increased space available, the set-up of the Laboratory was altered fully. The old building was set apart for electrolytic restoration and for a dark room for developing X-ray films. The main hall on the ground floor of the new building was made the Analytical Section. One room was set apart for the Curator's office and another, for a small lecture room. At various stages int he expansion of the laboratory from the constuction of the building to the installation of furniture and equipment, Dr. Paramasivan gave valuable advice.

It was at about this time in 1962-63, that three reports about "Museum objects in Hot and Humid climates". "Conservation of stone" and "Electrolytic Treatment of Metals" were prepared for the ICOM Committees and sent. in the consolidated reports issued by the ICOM Committees later, these reports were incorporated. Mr. H. J. Plenderleith, the Director of the Rome Centre visited the Laboratory on 31st Jan. 1964. In Feb. 1965 Thiru N. Harinarayana left the Lab. to be the Asst. Chemist. incharge of the Conservation of Laboratory of the Salar Jung Museum At this another Chemical Engineer Mr. S. Thangavelu was made Curator, Chemical Conservation and continued till 1972. During this time Mr. Thangavelu took interest in the atmospheric factors affecting Museum objects. He also contributed a paper on the set-up of the Laboratory to "Studies in Conservation" publiahed by the International Institute of Conservation, London.

Mr. Harinarayana came back to be in charge of the Lab. in 1972. At this time the Lab. took on a number of conservation projects out side the Museum and he continued till 1977 Dec. When he was made Asst. Director of Museum Mr. Thangavelu took over at this time and left in Feb. 1978 and Mr. Jeyaraj was appointed as Curator from April !978 and has continued as Curator to the present.

During the seventies, the Chemical Conservation laboratory of this Museum came to be associated more and more with the task of helping in the conservation of important art treasures outside its collections while continuing to look after its regular work of conservation of the objects in the Museum. The earliest of such tasks was the treatment of 14th Century Hoysala paintings in the Venugopala Shrine of the Srirangam Temple. This was carried out in 1972 and the then Curator not only treated these paintings but also studied the paintings in other parts of the same temple and prepared a detailed

report on the action to be taken to preserve them. Other tasks undertaken ranged from the study of salt-encrusted pillars in the temple at Thiruvallur near Madras to the damaged temple car at Nedungudi in Pudukottai District, from the badly affected paintings on the walls around the Golden Lily Tank in the Madurai Temple to the stained marbles in the St. George's Cathedral and the discoloured prints in the Raj Bhavan. The most interesting study was that of salt-encrusted granite pillars in the Thiruvallur temple. The effect of the salt was such that the granite surface has been greatly weakened and is found to crumble at the touch. The report on the possible method of conservation of this was also given and if implemented, it would be an important achievement in conservation. The study of the use of X-ray fluoresence for the analysis of bronzes and copper coins was made with the help of the Bhabha Atomic Research Centre at Bombay so as to assess the possibilities of correlating metal composition of objects with their date and provenance. Further studies on the same lines were carried out in collaboration with the Forensic Laboratory in Madras and the Electronic Corporation of India Limited who brought their portable XRF equipment for this purpose.

On the conservation side, the restoration of 12 oil paintings of the British Governors of Madras previously kept in the Rajaji Hall, was an important piece of work Sixty-eight, 19th Century British prints in the Madras Raj Bhavan were treated for discolouration and fragility of paper and reframed to improve their appearance. Marbles in the St. George's Cathedral and the St. Andrews Church both at Madras were found to be stained due to dust and insect droppings and algae. The stains were removed to make the statues look much better. Recently the present Curator, Thiru V. Jeyaraj helped in censerving the famous bronze statue of Dupleix in Pondicherry.

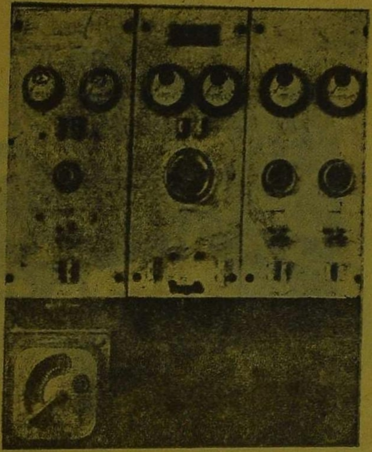
The Conservation Laboratory has not only interested itself in helping preserve objects and examining art materials but also in disseminating knowledge about conservation especially among personal from other museums and allied institutions. This has been done primarily through an annual Refresher Course entitled "Care of Museum Objects". The first of these courses was organised in 1974, and these have been held yearly ever since and have attracted curators, chemists etc. from museums, universities and other institutions in different parts of the country. Regularly the Curator of the Laboratory gives popular letures on selected topics in conservation. Moreover special exhibitions or special exhibits depicting aspects of conservation of different types of materials are arranged in the museum or in the museum pavilion in the annual trde fairs, thereby trying to put across to the lay public a basic idea of conservation.

Further expansion of the scope of work in the Lab. is also being contemplated. The first step in this direction has been to increase the staff in the section, for which proposals have already been sent to Govt. One additional Tech. Asst. has been appointed. This would be sought to be carried further so that more and more conservation work could be undertaken by this Lab. One scheme which is contemplated would be to undertake a thorough study of the composition of bronzes through non-destructive analytical methods like X-ray fluorescence and correlate it with the date and provenance of bronzes and establish the possibility of "finger-printing" these valuable objebts of art.

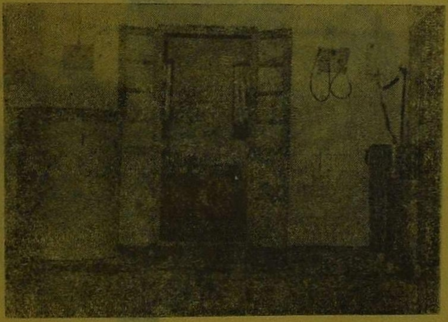
From its beginnings, the Lab. has been, in its own way, taking the lead in conservation studies. The electrolytic method itself was adapted, in terms of equipment

and technique from small bronzes for which it had been initially developed to the large bronzes in this collection. Studies of techniques of wall paintings were undertaken in this Lab. much earlier than elsewhere, and it was made systematic and sound. It is this tradition which is being continued even now, and on the occasion of the Golden Jubilee of the Laboratory, it is visualised that this would be continued so that technical studies of art objects and their conservation would be maintained at a high level.

N. HARINARAYANA
Director of Museums.

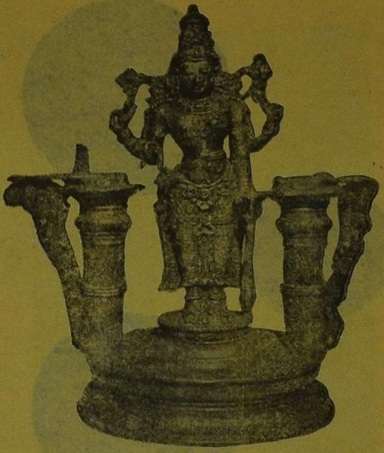


Electrolytic restoration: Control panel for the Motor Generator Set.



View of the Cleaning and Washing room

Bronze image - Before treatment

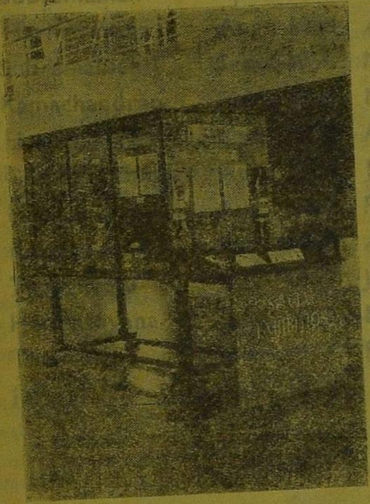


Bronze image - After treatment

Silver Coins - Before treatment

Silver Coins - After treatment

Refresher Course Trainees at work



Special Exhibition on "Glass"

LIST OF CURATORS

1.	Dr. S.Paramasivan	Apr	1930		1946
2.	B. Narayana Shenoy		1946	Jan	1949
3.	R. Subramanian	Jan	1949	Dec	1950
4.	K. Subramanian	Dec	1950	Apr	1951
5.	T. V. Satyamurti	Apr	1951	Apr	1952
6.	R. Subramanian	Apr	1952	Apr	1954
7.	N. Harinarayana	Aug	1954	Aug	1955
8.	R. Subramanian	Sept	1955	May	1956
9.	B. Ramachandran	May	1956	May	1958
10.	N. Harinarayana	May	1958	Aug	1961
11.	V. Gopalakrishnan	Aug	1961	July	1962
12.	N. Harinarayana	Aug	1962	Feb	1965
13.	M. Kalyani	Feb	1965	Apr	1965
14.	S. Thangavelu	May	1965	June	1972
15.	N. Harinarayana	June	1972	Nov	1977
16.	S. Thangavelu	Nov	1977	Feb	1978.
17.	V. Jeyaraj	Apr	1978		

DOWN THE YEARS:
Highlights of work in the Laboratory

1931 - Installation of motor generator for electrolytic restoration.

1934 - Preservation and x-ray studies of Nagapattinam bronzes.

1935 - Preliminary report on the mural paintings in the Brahadeswara Temple at Tanjore (June to July 1935).

1937-38 - Study and preservation of wall paintings at Sittannavasal.

1938-39 - Studies of ths techniques of wall paintings in fifteen well known sites.

1939-40 - Systematic study of the metallography of bronze objects and prehistoric implements.

1944-45 - Examination of Maratha paintings in the Tanjore Palace and the Chola paintings in Brahadeswara temple at Tanjorer.

1952-53 - Experiments in museum climate in the National Art Gallery and the main Museum buildings; experiments in the use of latex for takinkg moulds of image and coins.

1953-54 - Experiments in the use of Asiatic seaweed for preparing moulds.

1954-55 - Research in the treatment of metal objects in the John Hopkins University (by R. Subramanian)

1959 - Special Exhibition on "Glass".

1961-62 – Special exhibition on electrolytic treatment of bronze images.

1962-63 - Preparation of three reports on "Museum objects in Humid and Hot Climates", "Electrolytic restoration of metals" and "Study of stones" for ICOM Committees.

1963 - Report on the preservation of bronzes in the Tanjore Art Gallery.

1972 - Preservation of paintings in the Venugopala Shrine in the temple at Srirangam.

1973 - Preservation of marbles in the St. George's Cathedral, Madras.

1973 - Preservation of oil paintings in the Rajaji Hall, Madras.

1973 - Examination of ancient pottery specimens for the University of Madras. Department of Archaeology.

1973 - Preparation of report on conservation of museum objects in the Pudukkottai Museum.

1974 - Report on preservation of newspapers in the Swadesamitran office.

1974 - Special exhibition on conservation of iron objects.

1974 - Examination of paintings around the Golden Lily Tank in the Meenakshi-Sundareswarar Temple in Madurai.

1975 - Preservation of Tallapakkam Annamacharya copper plates of the Tirupati-Tirumalai Devasthanam at Tirupati.

1975 - Examination of a temple car at Nedungudi near Pudukkottai and report on its conservation.

1975 - Examination of paintings in Sri Varadarajaswamy temple in Kancheepuram and report on their conservation.

1975 - Examination of salt-encrusted pillars in the temple at Thiruvallur and report of suggested treatment sent to the Temple authorities.

1976 - Experiments on analysis of three small metal objects through the use of isotope-excited X-ray fluorescence in the Bhabha Atomic Research Centre, Bombay.

1976 - Preservation of British Prints of the Raj Bhavan, Madras.

1977-78 - Preservation of marbles in the St. Andrew's Church.

1979 - Preservation of oil paintings in the Madras Medical College.

1982 - Treatment of Dupleix statue-Pondicherry.

Published work from this Laboratory

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2. "Technique of the Painting Process in the Bagh Caves in Gwalior State".
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3. "The Wall Paintings in the Bagh Caves – An investigation into their methods".
   The Proceedings of the Indian Academy of Sciences Vol. X, No. 2, Sec. A 1939.
4. "Technique of the Painting process in the Rock-cut Temples at Badami".
   The Proceedings of the Indian Academy of Scieces Vol. X. No. 3, Sec. A, 1939.
5. "Technique of the Painting process in the Cave Temple at Sittannavasal".
   Nature, Vol. 139, pp 1, Jan. 16, 1937.
6. "The Mural Paintings in the Cave Temple at Sittannavasal – An investigation into the method".
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7. "The Pallava Paintings at Conjeevaram. An investigation into the Methods".
   The Proceedings of the Indian Academy of Sciences Vol X, No. 2, Sec. A, 1939.
8. "Technique of the Painting Process in the Brihadesvara Temple at Tanjore".
   Nature, Vol. 137, page 867, May 23, 1936.
9. "The Mural Paintings in the Brihadisvara Temple at Tanjore. An investigation into the Method".
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10. "Technique of the Mural Paintings in the Brihadisvara Temple at Tanjore".

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11. "Technique of the Painting Process in the Cave Temples at Ellora",

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12. "Technique of the Painting Process in the Temple of Vijayalaya Cholisvaram in Pudukkottai State".

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16. "Investigations on Ancient Indian Metallurgy".

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3. " Chemical Methods of Restoration and Preservation of Museum Exhibits ".

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2. "A Method of Recording Chemical Conservation Work". Studies in Museology, 1965.

3. " Cleaning of Paintings in the Sriranganathaswamy Temple at Srirangam".

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4. " Preserving the Past".

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5. " Conservation of Ethnological Material ".

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6. " Conservation of Art Objects and Antiquities "

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7. " Copper in Antiquity ".

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8. " A Laboratory for Small Museums ".

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9. " Some Problems pertaining to Conservation of Cultural Property".

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13. " Problems in Scientific Examination of Metal Objects".
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